

Awareness, Vaccination Uptake, and Barriers to Hepatitis B Vaccination among Undergraduate Medical Students: A Cross-Sectional Study

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ABSTRACT

OBJECTIVE: To evaluate the awareness, uptake and barriers to Hepatitis B vaccination among undergraduate medical students.

METHODOLOGY: Medical students at Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro were surveyed for this cross-sectional study. Participants completed a self-administered questionnaire on sociodemographic characteristics, awareness, vaccination uptake and completion, and barriers to vaccination. SPSS Version-20 was used to analyze the data of 312 participants. Percentages and frequencies were reported as categorical parameters and Chi-square tests assessed associations at $p < 0.05$.

RESULTS: Of the 312 participants, 43.3% were men, while 56.7% were women. The Majority of students (59.0%) had moderate knowledge of Hepatitis B, while 25.6% and 15.4% showed poor and good knowledge. Regarding vaccination status, 42.6%, of students had received at least one dose of the vaccine, 35.6% were unvaccinated, and 21.8% were unsure of their vaccination status. Knowledge level and vaccination uptake were significantly associated ($p = 0.002$), and the year of study was significantly associated with vaccination uptake ($p < 0.001$). Only 19.5% underwent post-vaccination antibody testing. Major barriers included insufficient knowledge, the lack of institutional vaccination requirements during early academic years, incomplete vaccination, and uncertainty regarding vaccination status.

CONCLUSION: The vaccination rate and execution were below optimal levels despite a moderate degree of awareness. Improving vaccination rate and lowering occupational risk can be achieved by creating institutional vaccination policy, enforcing vaccination requirements at enrollment and encouraging post-vaccination testing.

KEYWORDS: Awareness; Hepatitis B; Vaccine; Cross-sectional study; Undergraduate Students; Immunization Coverage

INTRODUCTION

Hepatitis B is a serious liver infection caused by the hepatitis B virus (HBV). HBV predominantly targets hepatocytes and can lead to acute and chronic liver disease, with long-term consequences including hepatocellular carcinoma and liver cirrhosis. Despite the availability of effective preventive measures, hepatitis B virus (HBV) infection continues to be a major global cause of morbidity and mortality. The World Health Organization (WHO) anticipated that 254 million people were living with chronic hepatitis B infection in 2022, and around 1.2 million new infections emerge each year¹⁻³.

HBV is transmitted through contact with infected body fluids, including blood, saliva, and semen. Transmission may also occur from an infected mother

to her child through perinatal (vertical) transmission during pregnancy or childbirth. Among the recognized routes of infection, unsafe injection practices, unprotected sexual contact, and mother-to-child transmission at birth remain the most common⁴.

The epidemiology of HBV differs substantially across regions of the world. Chronic HBV infection is most prevalent in the WHO African and Western Pacific regions, where prevalence exceeds 5%. In contrast, Europe and North America report prevalence rates below 1%, largely reflecting the long-term success of universal childhood immunization programs.^{1,5} Although prevalence is highest in the African and Western Pacific regions, Asia accounts for the largest number of people living with HBV because of its large population base. China, India, and Pakistan contribute considerably to the global burden of chronic infection, a pattern influenced by historical endemicity and gaps in immunity among older generations^{5,6}. Pakistan is classified as an intermediate-endemic country, with an estimated HBV prevalence of 3–5%, corresponding to nearly 7–9 million individuals affected by chronic infection⁷.

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Vaccination stands out as the single most effective tool for HBV prevention. Delivered as a three-dose recombinant series, the vaccine confers durable protection, and the WHO has recommended its routine administration since 1992, with particular emphasis on occupationally exposed groups such as healthcare workers^{1,8,9}. For medical students, occupational risk begins early in training. Ward rotations, surgical exposure, autopsy postings, and cadaveric dissection all bring students into contact with blood and body fluids, heightening their vulnerability to HBV acquisition. Yet even with a safe, effective vaccine readily available, uptake among medical students in many low- and middle-income countries, Pakistan included, falls short of expectations. Limited awareness, incomplete adherence to the recommended dosing schedule, and assorted behavioral and institutional obstacles continue to constrain vaccination coverage in this group¹⁰⁻¹³.

However, evidence regarding the awareness, vaccination uptake, and perceived barriers to hepatitis B vaccination among undergraduate medical students at Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, remains scarce. Therefore, this study aimed to assess the awareness, vaccination uptake, and perceived barriers to hepatitis B vaccination among undergraduate medical students at LUMHS, Jamshoro.

METHODOLOGY

This study was designed as an analytical cross-sectional, questionnaire-based study conducted among undergraduate MBBS students of LUMHS, Jamshoro. The study was carried out from August 2025 to January 2026 after obtaining ethical approval from the Institutional Review Board (IRB) of LUMHS, Jamshoro.

A Convenience sampling technique was used to recruit eligible participants.

OpenEpi software was used to calculate the sample size. As reported by Asif M et al.¹⁴ in a study of 375 participants, for calculation of the required sample size, vaccination uptake prevalence of 57% among medical students from previous research was considered. The minimum required sample size was calculated to be 312 participants by using a 95% confidence level and a 5% margin of error.

All undergraduate MBBS students enrolled at LUMHS from 1st year to final year were eligible to participate. Postgraduate students, faculty members, and those who refused consent were excluded.

A structured, self-administered questionnaire was used to collect the data. The questionnaire consisted of four sections: (i) demographic characteristics, (ii) awareness and knowledge regarding hepatitis B and its vaccination, (iii) vaccination status including

completion of the full three-dose schedule, and (iv) barriers, attitudes, and perceptions related to hepatitis B vaccination. Incomplete responses were excluded from the analysis after checking the completed questionnaires. Participant confidentiality was strictly maintained throughout the study.

Data were analyzed using IBM SPSS Statistics version 20. Descriptive statistics were employed to summarize study variables. Categorical variables, including gender, year of study, awareness level, vaccination status, and barriers, were expressed as frequencies and percentages and displayed in tables.

The Chi-square test was employed to investigate associations between categorical variables such as vaccination status and demographic factors like gender, year of study, and awareness level. A p-value ≤ 0.05 were considered significant. All analyses were performed at a 95% confidence level.

Ethical approval was obtained from the Institutional Review Board (IRB) of LUMHS, Jamshoro (Reference No. LUMHS/REC/-895). Written informed consent was obtained from all participants prior to data collection. Participation was voluntary, and confidentiality and anonymity were strictly maintained.

RESULTS

A total of 312 medical students were included for the final analysis and no missing data was found for the core study variables (mean age 21.20 ± 1.44 , range 18-27). The females were more in number than the males, the clinical years were more in number than other years, most reported to be from urban areas and family monthly income above 100,000 PKR. The general knowledge of Hepatitis B was mainly moderate (59.0%) with only 15.4% good knowledge (Table I).

Overall, 42.6% of students had received at least one dose of Hepatitis B vaccine, 35.6% were not vaccinated and 21.8% were not sure of their status. Uptake increased significantly with knowledge level (26.3% to 60.4%, $p = 0.002$) and, most importantly, with year of study – from 3.7% in 1st year to 62.5% in final year ($p < 0.001$) – with a corresponding decrease in those not sure of their status (48.1%–12.5%). There were no significant differences between gender, residence and family income in terms of uptake (all $p > 0.05$) (Table II).

Of the 133 students who had begun vaccinations, 56.4% indicated completing a 3-dose course and 31.6% reported they didn't know how many doses they had taken. Only 19.5% were tested for HBsAb following vaccination (Table III).

Combined, these data portray a vaccination cascade where less than half of students started vaccination, approximately half of students who started vaccination have finished the series, and fewer than one in five students had a confirmed antibody test.

Table I: Demographic and knowledge characteristics of the study population (N = 312)

Characteristic	Category	Frequency (n)	Percentage (%)
Age in years, Mean $\pm$ SD	21.20 $\pm$ 1.44 (range 18–27)	—	—
Gender	Female	177	56.7
	Male	135	43.3
Year of study	1st year	27	8.7
	2nd year	65	20.8
	3rd year	108	34.6
	4th year	88	28.2
	Final year	24	7.7
Residence	Urban	198	63.5
	Rural	114	36.5
Monthly family income (PKR)	<25,000	17	5.4
	25,000–50,000	46	14.7
	50,000–100,000	66	21.2
	>100,000	183	58.7
Level of knowledge	Poor	80	25.6
	Moderate	184	59.0
	Good	48	15.4

Table II: Association of sociodemographic characteristics and level of knowledge with Hepatitis B vaccination uptake (N = 312)

Variable	Total (N)	Vaccinated n (%)	Unvaccinated n (%)	Unsure n (%)	p-value
Overall	312	133 (42.6)	111 (35.6)	68 (21.8)	—
Gender					
Female	177	75 (42.4)	62 (35.0)	40 (22.6)	0.922
Male	135	58 (43.0)	49 (36.3)	28 (20.7)	
Year of study					
1st year	27	1 (3.7)	13 (48.1)	13 (48.1)	<0.001
2nd year	65	27 (41.5)	26 (40.0)	12 (18.5)	
3rd year	108	47 (43.5)	32 (29.6)	29 (26.9)	
4th year	88	43 (48.9)	34 (38.6)	11 (12.5)	
Final year	24	15 (62.5)	6 (25.0)	3 (12.5)	
Residence					
Urban	198	91 (46.0)	66 (33.3)	41 (20.7)	0.291
Rural	114	42 (36.8)	45 (39.5)	27 (23.7)	
Monthly family income (PKR)					
<25,000	17	9 (52.9)	5 (29.4)	3 (17.6)	0.150
25,000–50,000	46	15 (32.6)	25 (54.3)	6 (13.0)	

50,000–100,000	66	27 (40.9)	23 (34.8)	16 (24.2)	
>100,000	183	82 (44.8)	58 (31.7)	43 (23.5)	
Level of knowledge					
Poor	80	21 (26.3)	40 (50.0)	19 (23.8)	0.002
Moderate	184	83 (45.1)	59 (32.1)	42 (22.8)	
Good	48	29 (60.4)	12 (25.0)	7 (14.6)	

Table III: Vaccination series completion and post-vaccination HBsAb testing among vaccinated students (n = 133)

Outcome (among vaccinated, n = 133)	n	%
Completed full 3-dose schedule	75	56.4
Received 2 doses only	15	11.3
Unsure of dose count	42	31.6
Did not complete series	1	0.8
Underwent HBsAb testing	26	19.5
Did not undergo HBsAb testing	94	70.7
Unsure of testing status	13	9.8

DISCUSSION

This study fills the gap in the literature by quantifying the gaps in initiation, completion of series and post vaccination serological confirmation, and associated factors such as demographic, academic and knowledge factors in a single cohort of medical students in Pakistan. This approach, based on a combined, cascade-based assessment, is unique compared to many previous surveys, which only report on uptake without checking for completion of initiated series or confirmation of protective immunity. Uptake in this cohort (42.6%) was lower than the uptake reported among medical students at Mirpurkhas, Sindh (57%)¹⁴, and was less than the two-thirds full vaccination among health workers in two secondary care hospitals elsewhere in Sindh that mandated vaccination upon entry to the job, where job-entry vaccinations were correlated with higher full vaccinations²⁵. The proportion of people covered was also below the WHO target of $\geq 90\%$ coverage for high-risk groups^{15,16}, although similar to coverage levels in Ethiopia, Uganda, Somalia and Sudan^{15,17–19}, all of which reported coverage below the WHO target. The observed difference between this and other Pakistani cohorts suggests that a significant proportion of the differences in coverage between and within countries may be explained by differences in institutional vaccination policy and access to on-site vaccination services, in addition to country-level factors or awareness about vaccines.

The positive association between level of knowledge and vaccine uptake ($p = 0.002$) documented here parallels that of other health-science students in Vietnam, Ethiopia, Sudan and Somalia^{7,18,21,22} as well

as a Pakistani study in which higher knowledge, attitude and practice was associated with increased vaccination uptake among medical students in Karachi²⁴. Most participants in the present sample had moderate knowledge (59.0%), but overall uptake remained under 50% — unlike settings where low uptake is typically attributed to poor knowledge. Among students who had good knowledge, uptake was only 60.4% which was far from the WHO target. This means that, beyond a certain level, increasing knowledge does not necessarily lead to an increase in vaccine uptake, and simply health education is unlikely to close the gap unless accompanied by structural and/or policy-level interventions.

The strongest predictor of uptake was year of study ($p < 0.001$) with uptake increasing sharply from 3.7% to 62.5% between 1st year of study and final year, respectively, and the proportion not knowing the vaccination status decreasing sharply from 48.1% to 12.5% over the same period. This is similar to what has been documented in Ethiopia, Uganda, Somalia and Sudan where the greater proportion of students in the clinical years are covered as compared to those in the preclinical years^{17–19,21}. The gradient is not observed, however, in institutions with requirements for pre-enrollment vaccination, where immunity is achieved prior to clinical exposure. This gradient is steep and monotonic and is therefore indicative of a reactive approach to vaccination (increasing clinical exposure, e.g. ward rotations, needle-sticks) rather than a pro-active approach at the beginning of medical training as recommended in the occupational health guidelines²⁰.

56.4% of students who had already started vaccination received the 3 doses, and 19.5% of students had HBsAb tests. The percentage of students with post-vaccination serology was comparable to other settings reporting 1.6% to 34.8% of medical and health-science students with post-vaccination serology and 2.8% to 37% full dose coverage²².

However, it is important to highlight that in South Africa more than 50% of healthcare students were not immunized prior to a booster dose and 7% remained non-immune following completion of the vaccination course²⁶. If applied to the current population, this scenario implies that many of the 56.4% who reported having three doses of the vaccine may not be seroprotected, a question which cannot be answered without serologic testing. Uptake-only studies cannot structurally account for this gap, and it argues for the importance of separating the rates of initiation, completion of series and antibody confirmation.

An interesting result was that 21.8% of all participants and nearly half (48.1%) of students in 1st-year were unable to report their vaccination status. The degree of uncertainty is similar to that reported elsewhere of poor documentation and recall of immunization status among health-science students²³ and may be due to lack of a single, easily accessible immunization record

at the institutional level, and a lack of previous involvement with preventive health services prior to entering clinical training. The proportion of "unsure" responses that was reported is high when compared with other studies conducted when immunization cards were given to students or when the immunization status was known on electronic health records, where it is typically much lower, which could suggest a lack of documentation, but also suggest that interventions to better document the immunization status of students may have a significant impact on the accuracy of future surveillance and on individual student's awareness of their own protection status.

CONCLUSION

This study is an observation of the awareness gap, uptake, completion and barriers of Hepatitis B vaccination among medical students of LUMHS Jamshoro. Although a moderate level of knowledge was seen, overall vaccination coverage, completeness of vaccination and post-vaccination antibody testing was limited. Institutional vaccination policies, mandatory vaccination at entry and the promotion of post-vaccination testing could enhance the level of protection and reduce occupational risk among future healthcare workers.

Limitations:

There are a number of limitations to this study. Due to the cross-sectional nature of the design, however, no causal inferences can be drawn about the relationship between the knowledge and vaccination behaviors. Vaccination status, dose completion and testing history were all self-reported and thus may have been subject to recall bias, as shown by the percentage of respondents who reported not being able to remember whether vaccine was administered or not. Although age was a study goal, there was no meaningful age-stratified analysis because of the narrow age range of the participants (21.20 ± 1.44 years); future multi-institution studies with a larger age range of participants are recommended to overcome this limitation. The precise prevalence figures may not be generalizable to other centers – though the general trend of moderate knowledge, low full dose coverage and minimal post-vaccination serology is reported from a variety of settings both within Pakistan and internationally – as the study is a single center study carried out at LUMHS.

These findings are consistent with those of Pakistan, South Africa, Nepal, Vietnam and Uganda and highlight the need to roll out the recommended Hepatitis B vaccination upon enrolment, with a particular focus on 1st year students who were almost entirely unprotected and undocumented. Furthermore, routine testing for HBsAb should be incorporated into institutional health services as this will confirm the seroprotection directly, and not just be a proxy for immunity, which is assumed from self-report of having completed the series. Beyond the individual student,

the immunization and confirmed seroprotection of healthcare workers will help protect patients not just due to the roles they play as a key population for nosocomial transmission but also due to their contribution to national and international goals for HBV infection prevention in health care.

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AUTHOR CONTRIBUTION

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